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**(54) Edible composition comprising dietary vegetable fibre**

(67) An edible composition comprises a combination of a dietary vegetable fibre, such as wheat bran, bagasse etc., and a metal salt of a natural protein, such as calcium caseinate. This composition can be used in the preparation of a dietetic or slimming product, for example biscuit products or bread sticks. Its ingestion offers the same beneficial effects as that of the dietary fibres, but eliminates the undesirable effects of proteins and mineral depletion.

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## SPECIFICATION

## Edible composition comprising dietary vegetable fibre

- 5 The lack of vegetable fibres in the diets of western countries is one of the factors responsible for many of the illnesses encountered in western civilisation. It wholly or in part causes the following digestive or general disturbances: simple constipation or constipation complicated by colitis, diverticulosis, polyposis, hiatal hernia, gastro-duodenal ulcers, biliary lithiasis, haemorrhoids, varices of the lower members, obesity, diabetes mellitus, atheromatosis and the like. 5
- 10 An awareness of this incorrect diet is responsible for a current tendency to enrich the diet in vegetable fibres and, in particular, in cereal fibres; the fact that these are richer in polysaccharides than in lignin makes them more useful than dietary fibres derived from vegetable or fruit. Thus, they increase the amount and viscosity of the stools, reduce the intra-intestinal and intra-abdominal pressures, improve the metabolism of the biliary salts, and slow down and reduce the absorption of carbohydrates and lipids. 10
- 15 Unfortunately, these advantageous effects are accompanied by undesirable side-effects, of which the most important is the depletion of proteins and minerals. 15  
If one considers the effect of such fibres in the diet, the useful reduction in the absorption of sugars and fats from food containing a harmful excess of carbohydrates and lipids is offset by the adverse consequences of increased excretion of nitrogen compounds, giving rise to protein depletion.
- 20 The mechanism of demineralisation has long been attributed to the chelating power of the phytic acid of such fibres, which captures calcium, magnesium, iron, zinc and the like. Unfortunately, dephytinisation of such fibres does not do away with the reduction in the availability of metals and it is, apparently, the fibres themselves which are responsible for the mineral depletion (J.G. REINHOLD et al., *Nutr. Rep.Inst.*, 1975, 12, 2, 75-85). 20
- 25 The object of the invention is to retain the virtues of increased ingestion of dietary fibres without simultaneously causing the depletion of proteins and minerals. 25  
We have found that by combining such dietary vegetable fibres with a metal salt of a natural protein, it is possible to preserve the advantageous effects of the fibre content, such as the effect on the digestive transit and on carbohydrate and lipid metabolism, without observing undesirable effects on proteins and minerals.
- 30 According to the present invention, therefore, there is provided an edible composition comprising a combination of a dietary vegetable fibre, preferably a cereal fibre (such as wheat bran), and a metal salt (such as a calcium, magnesium, iron, zinc, or cobalt salt) of a natural protein (such as a milk protein or an egg protein). 30
- It is preferred to use a caseinate of Ca, Mg, Fe, Zn, Co and the like, calcium caseinate being particularly preferred. The latter can contain from 1 to 2% of calcium, but the more acid it is, the less soluble it is. Calcium caseinate containing 1.7% of calcium has proved most manageable and provides the best flavour properties. 35
- Using the stable balance method, it has been shown, in the case of a chronically constipated man aged 67, that the calcium and magnesium balances, which were in equilibrium before any treatment, became negative (-17% for the calcium balance and -23% for the magnesium balance) after 1 month of additional provision of fibres (21 g of coarse wheat bran per day, taken in 3 portions). The addition, at the same doses of 40 bran, of 12 g per day, taken in 3 portions, of calcium caseinate containing 1.7% of calcium, not only restored an equilibrium balance of magnesium (+2%). During the experiment, the supply of calcium and magnesium through the food consumed was assessed from tables for the calcium and magnesium contents of the food in question, and remained substantially constant.
- 45 It thus appears that the addition of about 50% of calcium caseinate to the wheat bran virtually saturates its metal-fixing capabilities since the previous depletion of not only calcium, but also magnesium was corrected. 45
- Owing to the practical difficulties of carrying out the balance method, further work on use of the combination according to the invention was carried out by observing the clinical and blood parameters of a significant number of people from a wider population. 50
- The study related to 54 adults, namely 39 women (average age 41, extreme ages 16 to 83) and 15 men (average age 49, extreme ages 29 to 77). The following were examined systematically: general condition, digestive and neuro-muscular symptoms, blood pressure, weight and the following blood parameters: glycaemia, total protids, uricaemia, total lipids, triglycerides, cholesterol and (by atomic absorption spectrophotometry) Ca, Mg and Zn in the plasma and erythrocytes, and, finally, the iron content of the blood; the observations were carried out before any treatment and subsequently every month. The subjects were given a supplementary ration of coarse wheat bran, in an amount depending on their intestinal transit (on average 12 g; extreme doses 3 to 24 g) for 1 month. The following month, this supplementary ration was replaced by a provision of an equal amount of bran in the form of bread sticks each weighing 1 g, made from 55 the same bran and corresponding to the following recipe: 55
- 60 60

	Wheat bran	43%	
	Ca caseinate containing 1.7% of Ca	20%	
5	Cereal flour	35%	5
	Sodium chloride	2%	

10 The provision of crude bran for the first month reduced the intestinal transit and increased the volume of the stools for all the subjects. 10

Only in the minority of cases (9 observations, average age high, namely 67, 6 women, 3 men) did it reduce the protidaemia by more than 5 g per litre; it reduced the calcium and magnesium content of the erythrocytes respectively in 11 cases (7 women and 4 men) and 17 cases (11 women and 6 men), who all exhibited, beforehand, a positive Chvostek sign; it did not affect the iron content of the blood, except in the case of two old patients. 15

Among these subjects, the zinc content of the blood was frequently low (17 cases) before any bran was administered.

3 patients exhibited a dyslipidaemia, of which one was associated with badly balanced diabetes. In these 3 cases, a significant reduction of triglycerides was observed, accompanied with normalisation of the glycaemia in the case of diabetic patient, without any change in his diet. 20

After 1 month in which the crude bran had been replaced by the fibres/caseinate combination according to the invention, further examination of the patients showed that, on the one hand, the advantageous effects due to the bran, namely the same control of the intestinal transit and the same effects with respect of carbohydrates and lipids, were preserved, whilst on the other hand there was a regression of the side-effects observed with the crude bran, namely return to normal in 8 of the 9 cases where protidaemia was observed, return to the figures of the calcium, magnesium and zinc content of the red blood corpuscles observed before any treatment, and normalisation of the iron content of the blood in the 2 cases where it had dropped. 25

The ingestion of a metal salt of a protein and of dietary fibres, in accordance with the invention, thus has undoubted advantages compared to the ingestion of dietary fibres alone. A preferred combination according to the invention is the combination of calcium caseinate and wheat bran. The proportion of caseinate to fibres may be from 5% to 120% by weight; the optimum proportion is from 50 to 60%. 30

It is possible to use any other dietary fibre (bran from other cereals, bagasse and the like) and other metal salts of natural proteins (salts of Mg, Zn, Fe, Co and the like, or a combination of two or more of these salts), taking into account the requirements and the toxicity of the selected cation.

35 The combination according to the invention can be incorporated in any form of edible product and can, in particular, be present in the composition of dietetic products or slimming products, in particular biscuit products, which may be layered, moulded, extruded, cellular and the like, and may be dry or "embellished" (filled, coated, iced and the like).

#### 40 CLAIMS 40

1. An edible composition which comprises a combination of a dietary vegetable fibre and a metal salt of a natural protein.

2. A composition according to claim 1, in which the vegetable fibre is a cereal fibre.

45 3. A composition according to claim 1 or 2, in which the vegetable fibre is wheat bran. 45

4. A composition according to any of claims 1 to 3, in which the metal salt is a calcium, magnesium, iron, zinc or cobalt salt of a protein.

5. A composition according to any of claims 1 to 4, in which the protein is derived from egg albumin or milk casein.

50 6. A composition according to any of claims 1 to 5, in which the metal salt is calcium caseinate containing from 1 to 2% of calcium. 50

7. A composition according to any of claims 1 to 6, which contains from 5 to 120 parts by weight of calcium caseinate per 100 parts of wheat bran.

8. A composition according to claim 6, which contains from 50 to 60 parts of caseinate per 100 parts of bran. 55

9. A dietetic or slimming product, which contains a composition according to any of the preceding claims.

10. A product according to claim 9 is a biscuit product.

60 11. A product according to claim 9 which is a bread stick containing 43% of wheat bran and 20% of calcium caseinate containing 1.7% of calcium. 60